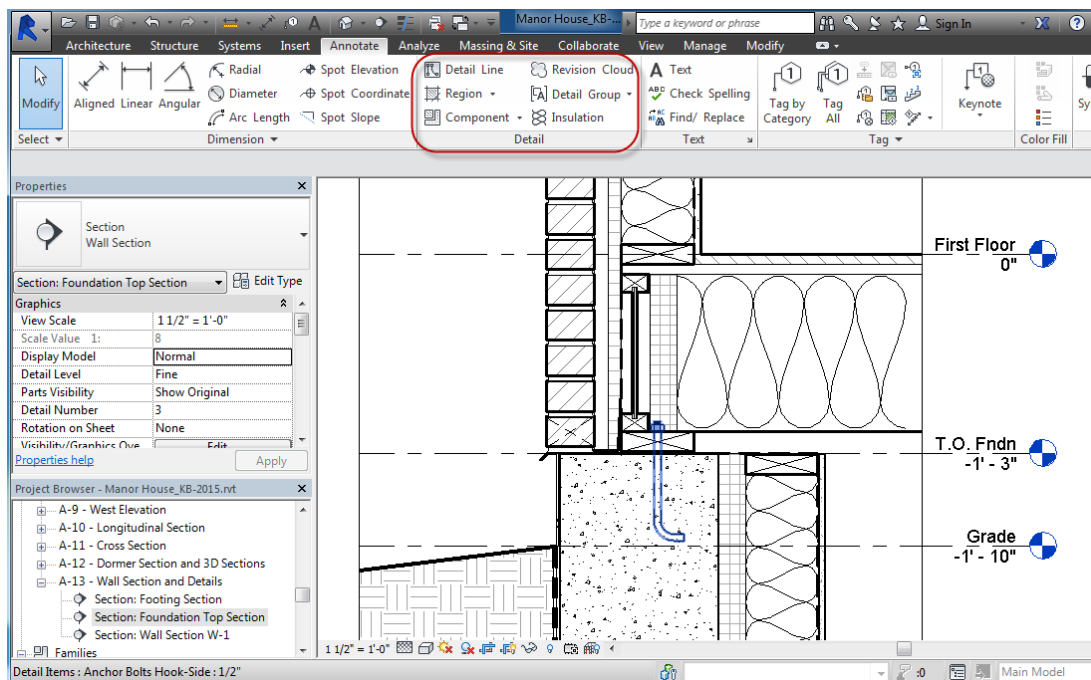


AGENDA:

1. Detailing Methods Overview – Detail Views and Drafting Views
2. Detail Components
3. Line based Components and Repeating Components

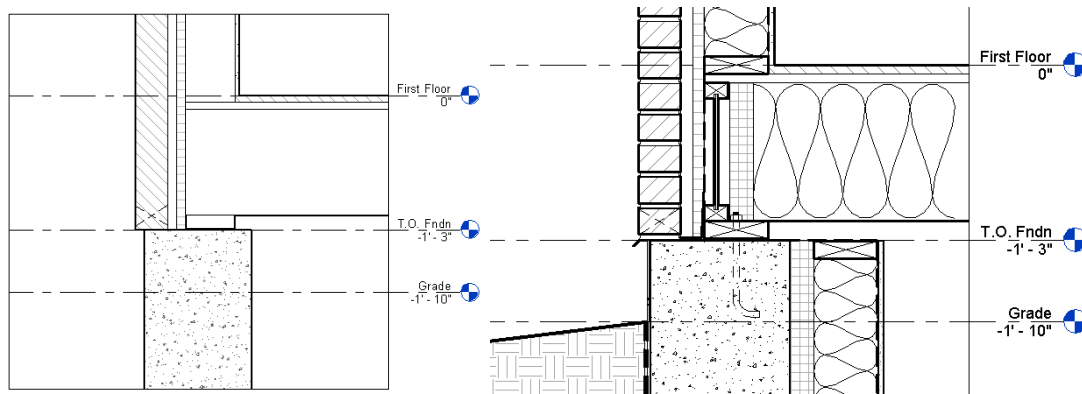
1. Detailing Methods Overview

Detail views are used to show specific information about an area in your building model. They may include notes, dimensions, and more elements than actually exist in the full, 3D representation of your building. For example, a brick wall in your main building model is a single volume but in a wall section detail view, you can indicate individual courses of brick, mortar thickness, masonry ties, and weep holes.



Attempting to include too many 3D elements in your building model will make the file too large to work with efficiently. It would also take far too much time to model every element in 3D. It is better to create a relatively simple 3D representation of the building and then use 2D details to convey specific information about how materials should interconnect.

There are two main methods for creating detail views. The most common method is to use an existing view of the actual 3D building model as a starting point or underlay for the detail and then add additional information with a mix of detail lines, detail components, filled regions, and insulation.



The two images above show the starting point for a standard detail view on the left and then the same view with various detailing elements added on the right side.

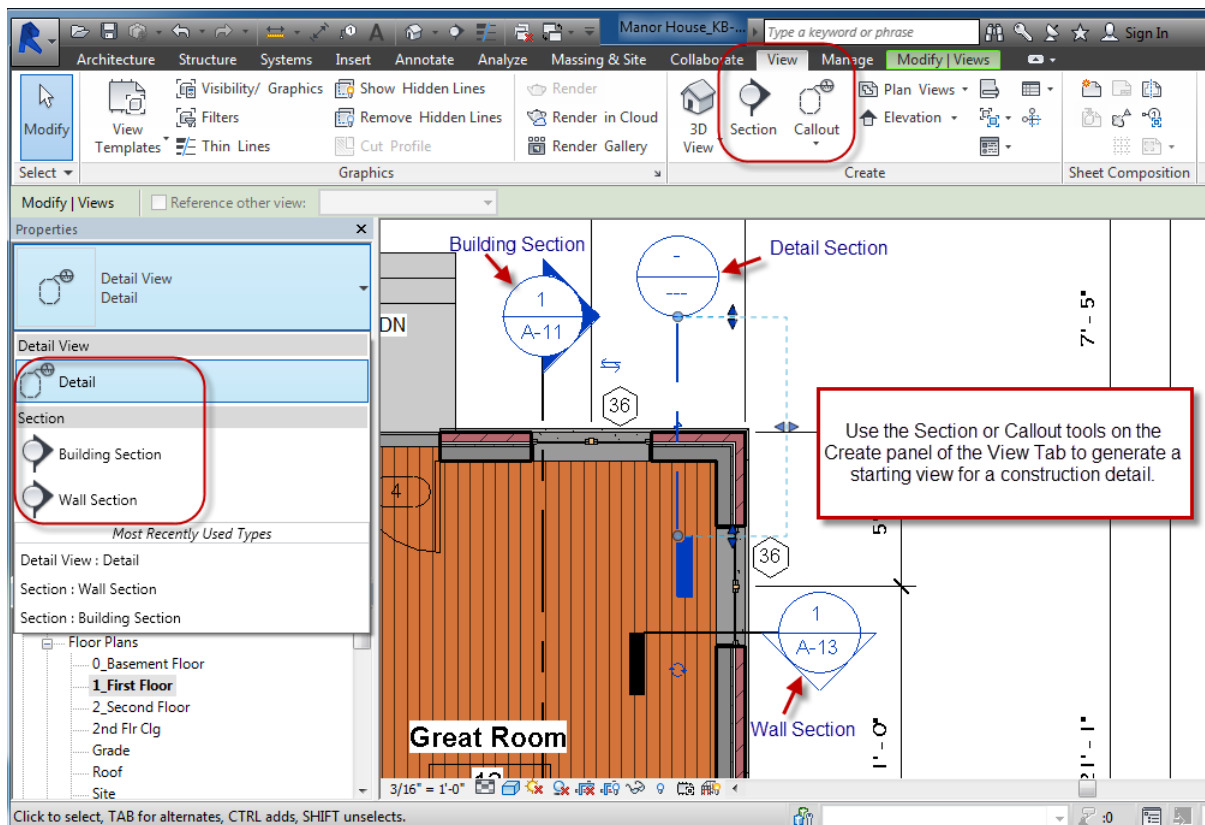
The second method for creating a detail is to use a Drafting View. A drafting view does not start with an existing view of your 3D model and is not related or connected to the actual building model. A drafting view is less commonly used but may be created for typical details that you might use on multiple projects.

When you create a Drafting View from the Create panel on the view tab, you give the view a name, specify a scale for the view, and are then presented with a blank sheet on which you can start constructing the detail.

Drafting views can use all of the same tools you would use for a Detail view including components, lines, regions, fills, repeating elements, and insulation. Drafting views will appear in their own category in the Project Browser and they can be dragged on to a sheet in the same manner as regular views.

Drafting views can also be created by importing existing 2D details from another program such as AutoCAD. Drafting views can be transferred between Revit projects by using the Insert Views from File tool on the import panel of the Insert tab.

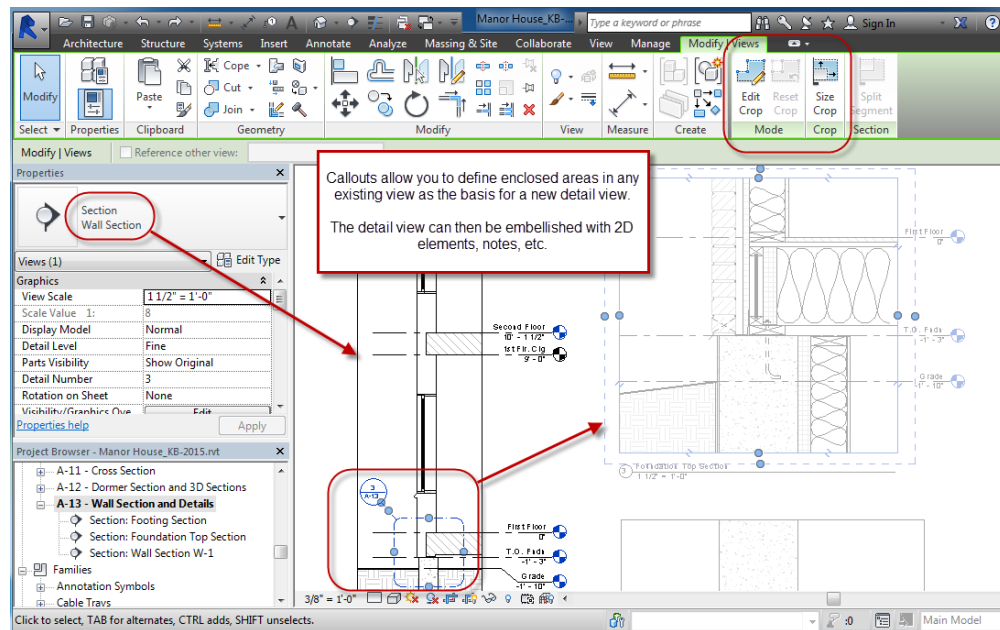
Typical detail views usually are created by using the Section or Callout tools on the Create panel of the View tab. The Section tool allows you to define a cutting line through a portion of the current view; typically in a plan view. There are two types of sections that can be generated: Building Sections and Wall Sections. The third type that can be created with the section tool is a Detail view. When you start the section tool, choose the Section type in the Type pulldown on the properties palette before drawing the section line. This will define the location for the view in the project browser as well as the appearance of the section head.



Building and Wall Sections defined with a section line in a plan view, will both create section views which initially extend about 4 feet above and below the vertical extents of your building model and 4 feet beyond the horizontal extents of the model in the direction of the view.

A Detail View defined with a section line in a plan view, will create a cropped section view which initially extends about 4 feet above and below the currently active level.

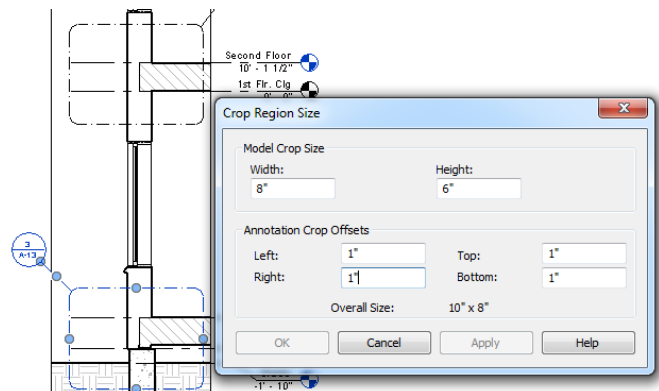
The Callout tool allows you to define an enclosed region for an enlarged detail view in the same direction as the current view. Callouts may be defined in any existing 2D view to create plan details, section details, or elevation details. By selecting the callout and then picking the type pulldown you can move a detail into different categories in the project browser.



One approach to creating a set of details for a building is to start by cutting a building section or wall section in a plan view. Next, in the resulting full height section views, you can use callouts to define enlarged section details showing the specifications for the construction in that location.

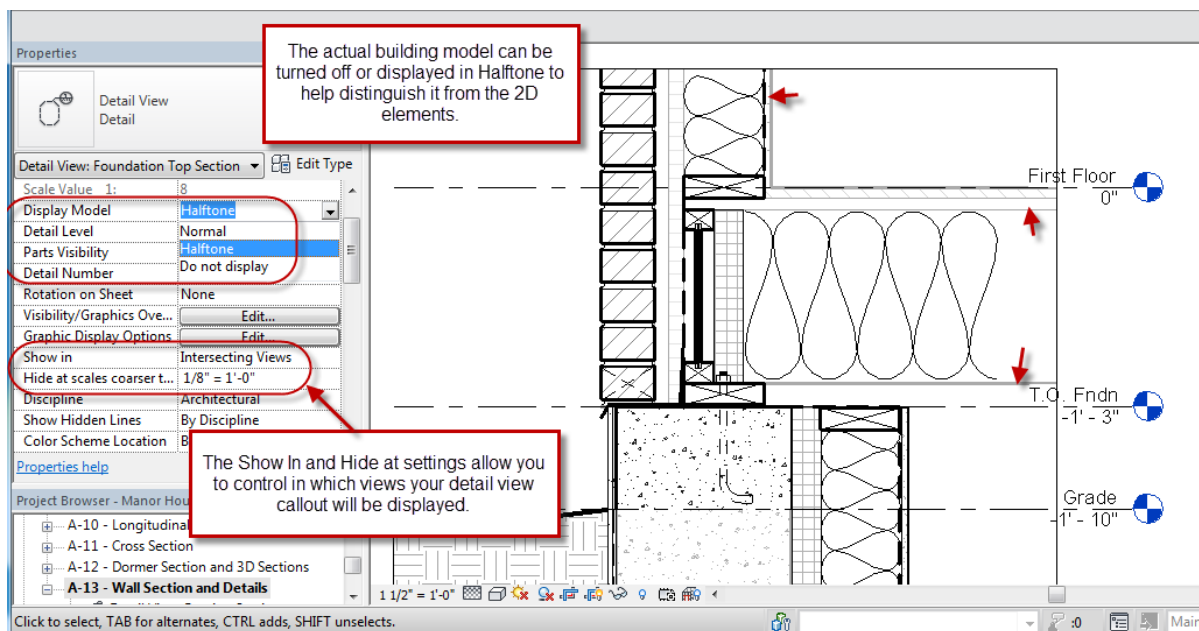
Callouts may be defined with a default rectangular shape, or by using sketch tools to define any enclosed region. When you select a callout, you can modify the size and position of the enclosed area with control grips and the move tool. If you double click the boundary, it will enter a sketch mode.

To create a series of callouts with identical sizes, you can use the Size Crop tool on the Ribbon to open a Crop Region Size dialog where you can specify exact measurements for the model crop size and annotation crop offsets.



A detail view is simply an enlarged view of your building which appears as a callout or section in one or more other views. When you create a detail view using a callout or section, by default it will only show its callout or section annotation in its Parent view.

To make a callout annotation appear in additional views, select the callout and in the properties palette, change the “Show In” option from Parent View to Intersecting views. You may also need to adjust the scale for the “Hide at Scales Coarser than” setting. The crop boundary of the detail view must intersect or exist within the overall boundary of the larger view in order for the detail view tag to be displayed.

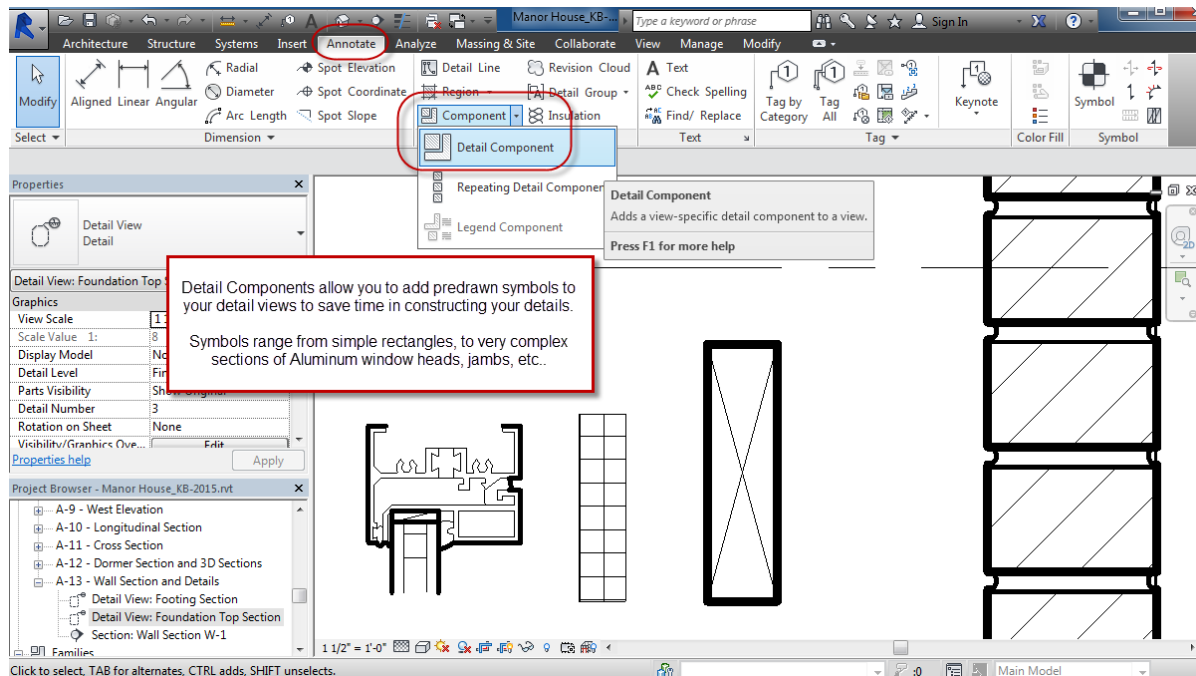


Additional settings in the detail view properties allow you to hide the 3D building model in your detail view by setting the Display Model property to “Do Not Display”. The Halftone option allows you to display the building model but in a faded, greyed out appearance to help distinguish it from the 2D detail.

Reference callouts may be created by enabling the Reference Other View option before defining the section line or callout region for a new view. This lets you associate the callout with any existing view in your project. A reference callout will display “SIM” by the callout head by default. This text is accessed via the Reference Label parameter in the Type properties for the system family.

2. Detail Components

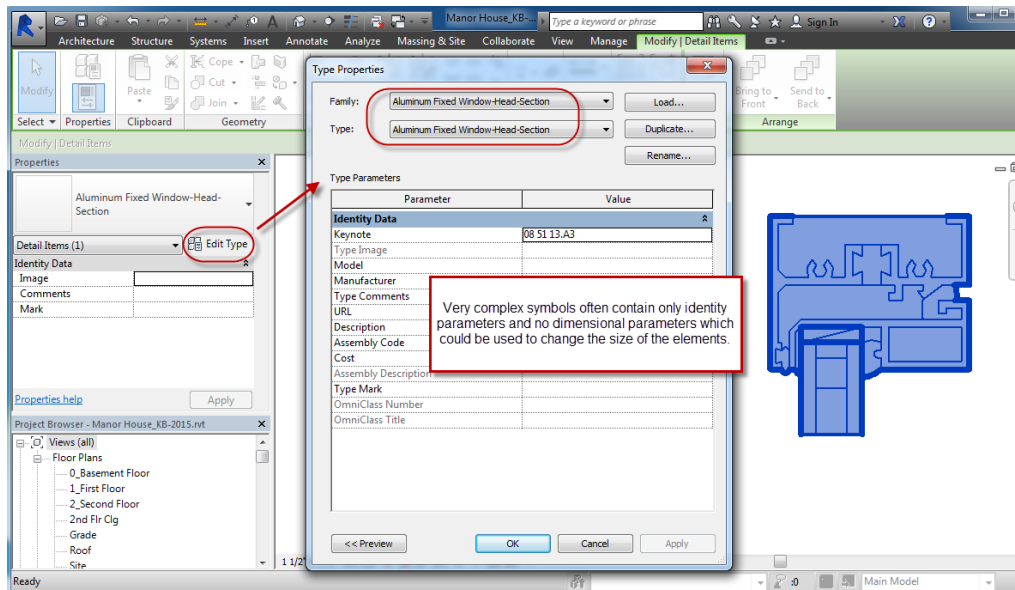
Detail components are just another type of revit family that can be loaded into a project from the family libraries. Developing a detail by adding pre-drawn 2D components is much faster than drawing the same detail with lines.



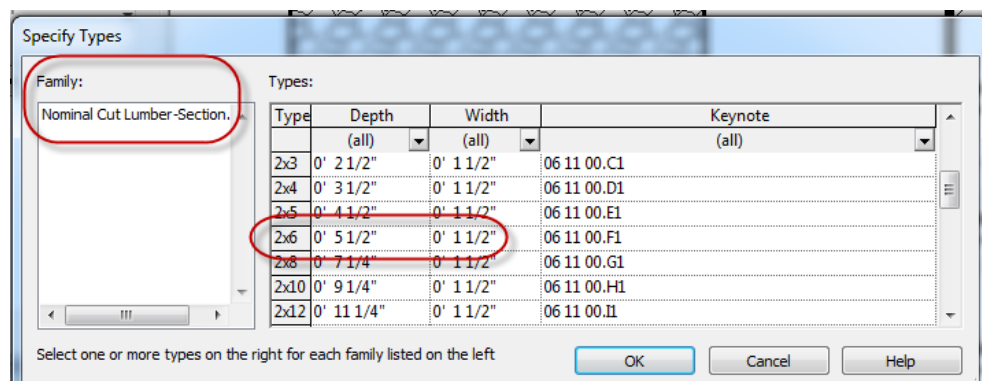
There are over 500 pre-drawn symbols of various components organized in 18 major divisions corresponding to the CSI or Construction Specification Institute divisions. Many of the symbols are simple rectangles with lines or fill patterns but some are extremely complex such as the Aluminum window head section shown in the image above.

Detail components are added from the component flyout on the detail panel of the Annotate tab. When you first access the detail component tool you will need to use the Load Family button to access the family libraries. Open the Detail Items folder and then navigate to the most appropriate Division category based on the material or type of component required such as Concrete, Masonry, Metals, or Wood. Depending on the category selected there may be numerous subcategories such as Clay Units, Glass Units, and Concrete Units inside the Div 04-Masonry category.

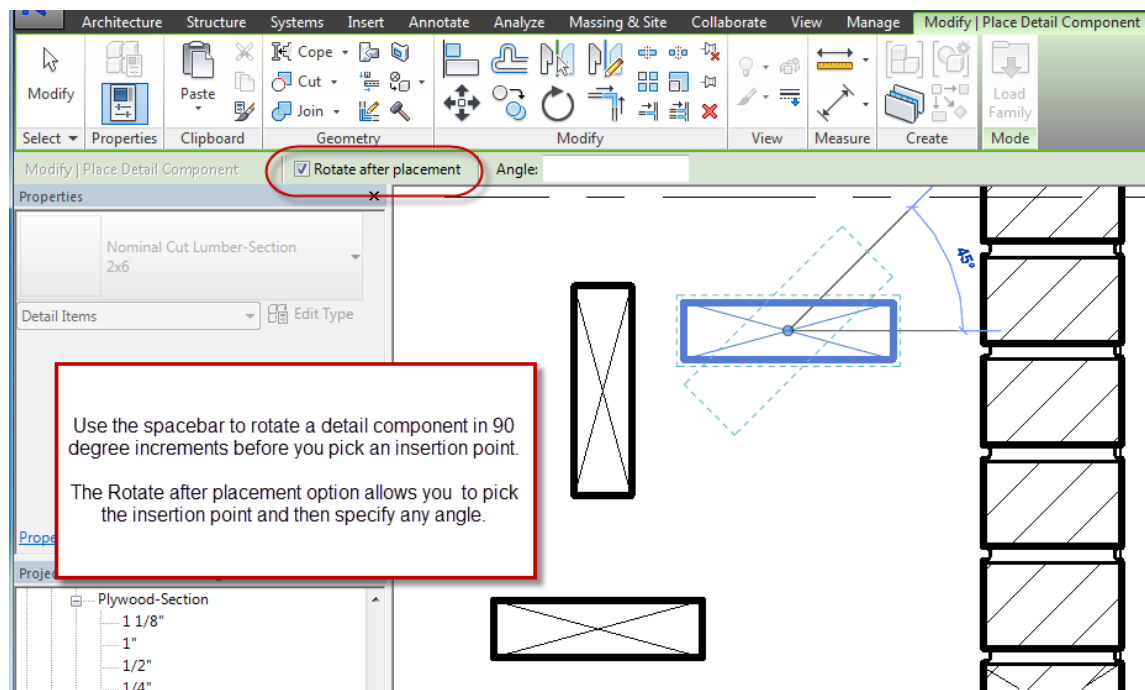
Detail components may have a single, fixed size, as in the case of the Aluminum Fixed Window – Head-Section shown below. There are no instance or type parameters and no prompt to select a size from a type library. The only way to edit the size or appearance of this type of component is to edit it in the family editor. This component does have a flip control which allows you to mirror the symbol to change the interior and exterior direction.



Some detail components such as nominal cut lumber or structural steel allow you first select a general shape such as a W-Steel Shape or a C Channel and will then display a type library with a huge range of specific sizes. You can select a single size to load or you can press CTRL and then select multiple types to load at one time.

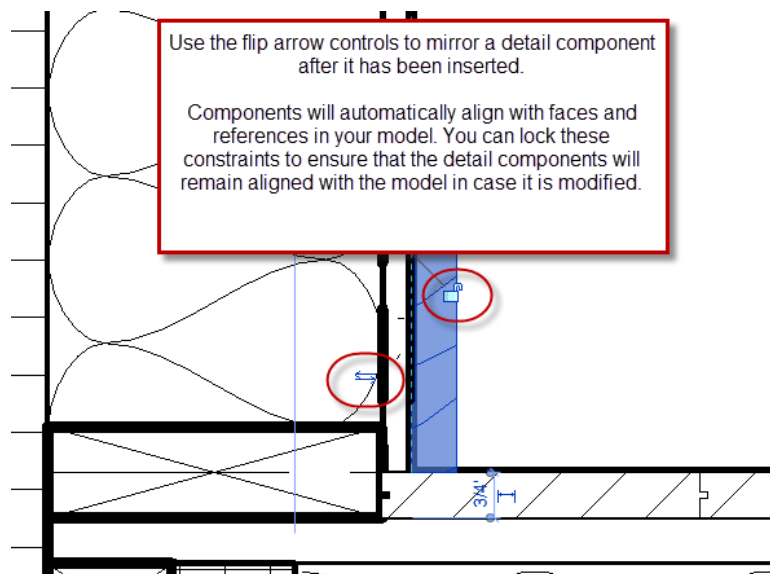


When you add any standard detail component, after you choose the desired type, the symbol will appear at your cursor, usually aligned with the centroid or corner of the component. If you press the spacebar, the component will rotate in 90 degree increments and as you move it near other elements it will automatically snap to locations on the model or existing components.

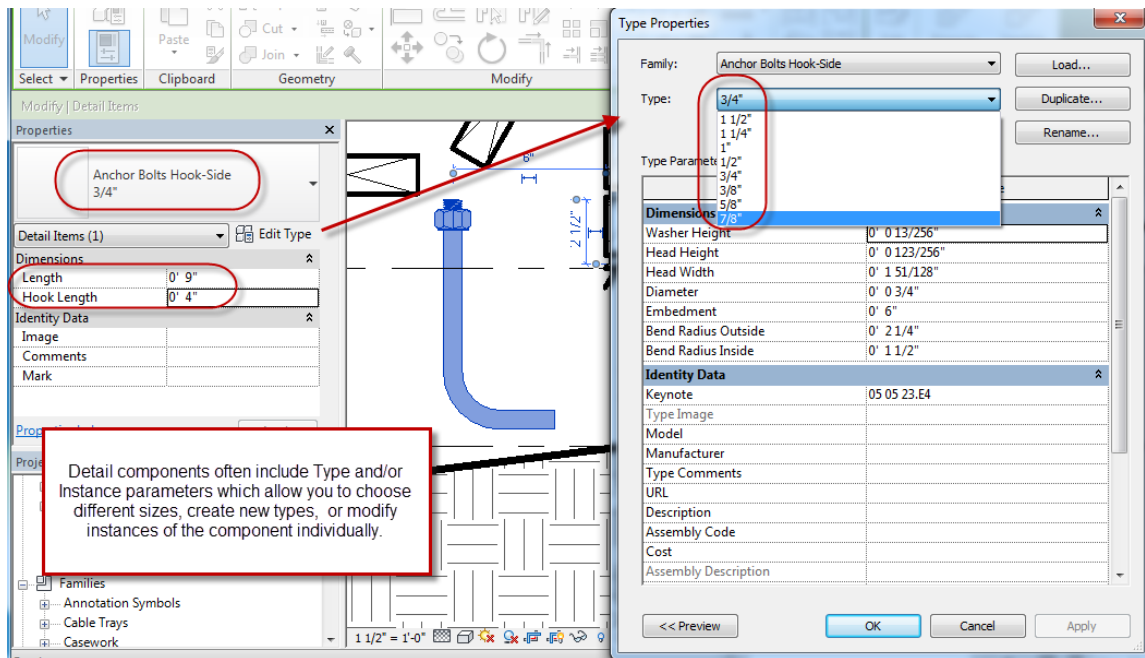


If you enable the Rotate after Placement setting on the options bar, you can enter an angle or pick an insertion point and then dynamically drag the rotation into the desired angle and pick again to set it.

Flip controls and lock constraints allow you to mirror a component and lock it into alignment with the model so it will follow the model if it is modified.



Many detail components will bring in multiple types with preset typical sizes that can be selected from the type pulldown. Often dimensional parameters are also included which will allow you to modify the size and shape on a per instance basis or by creating new types in the type properties.



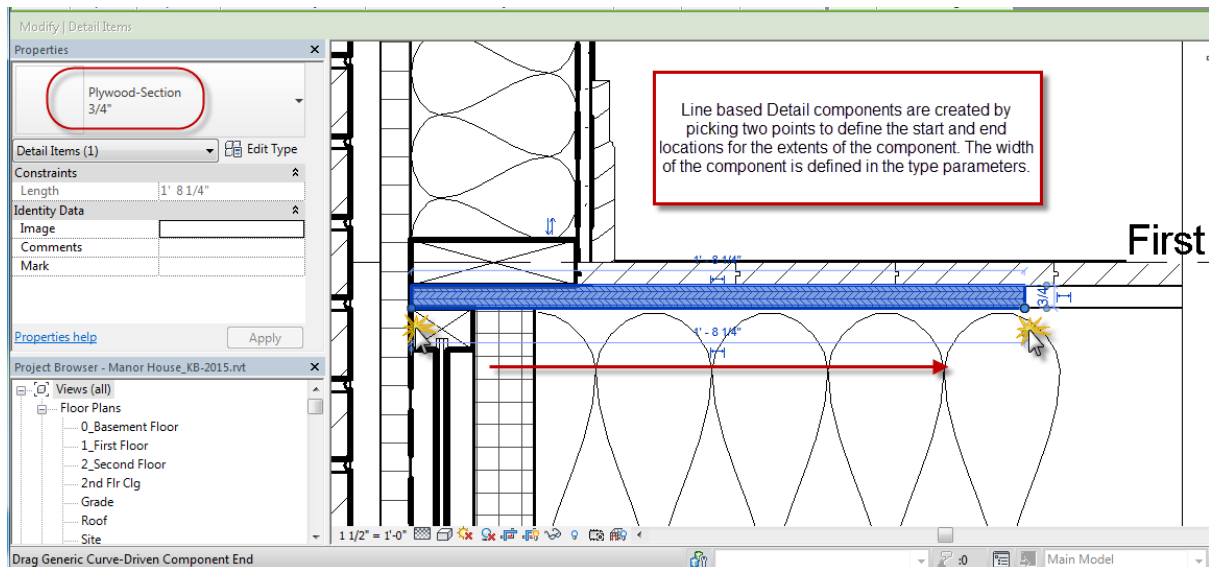
With over 500 component families included in the default libraries there is a good chance that the component you need will already be available. If you need a new component however, it is a relatively simple matter to create a new detail component family.

Before creating a new family from scratch, check to see if there is an existing family which you can open, save with a new name, and then modify to suit your purpose. Otherwise start a new family with the Detail Item template and then draw the symbol you need with lines and regions. Add any dimensional parameters required to control the size, add controls to allow you to mirror the component if desired, and optionally define a few preset sizes in the Family Types.

Detail components are strictly 2D based symbols so you will only need to draw a single representation in the default, top view. Align your symbol so the desired insertion point is at the intersection of the two default reference planes.

3. Line based Components and Repeating Components

A line based component is a special type of Detail component that allows you to pick two points as if you are drawing a line and it will then set the extents of the detail component between two points.



This type of detail component is used for materials such as plywood, rigid insulation, and drywall that will have a constant thickness or width but vary in length depending on the location.

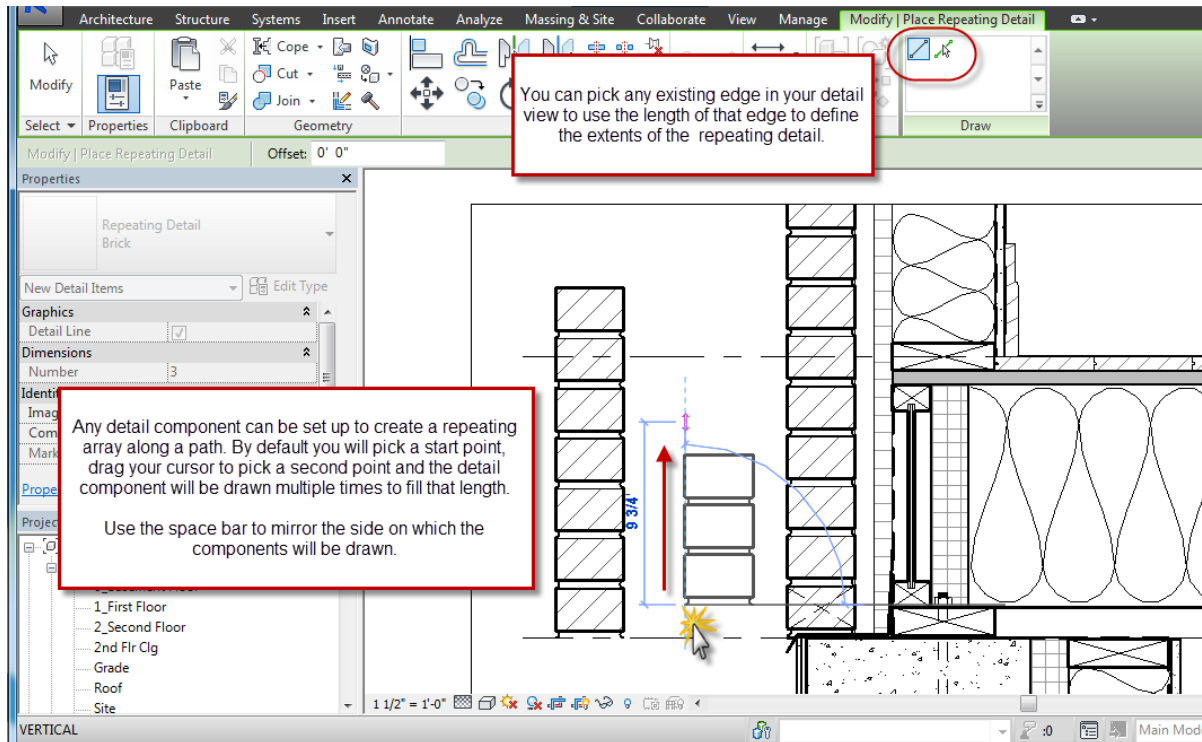
When you add a line-based detail component, you can also pick a start point and then enter a value for the length rather than picking a point to define the extents.

Line based components will have control grips at either end which will allow you to easily modify the length of the component after it has been inserted by picking and dragging the control grips.

Selecting a line based component's control grip will also activate a dimension parameter while you hold your mouse button down allowing you to enter an exact value for the length.

When you add a line based detail component, after you pick the first point and then start dragging your mouse, you can press the space bar to mirror the component's width before setting the extents of the length. When making your own line based components add a flip control to allow this behavior.

Repeating detail components allow you to create an array from any existing detail component. This is useful for drawing courses of brick or CMU's in a wall section view, or creating an array of framing members such as floor joists or rafters in a building section.

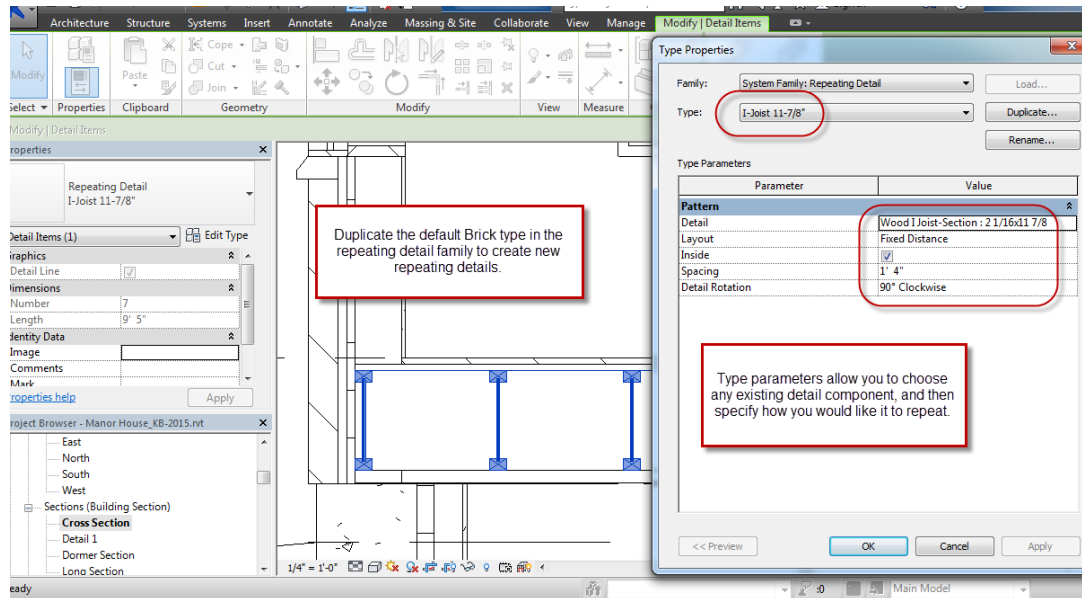


Access the repeating detail component tool from the component flyout. Initially, only one repeating detail, for brick coursing, will be available. To create a new repeating detail component, choose Edit Type and then Duplicate the default Brick type and select any detail component that has already been loaded into the project.

When you add a repeating detail component, you will be prompted to select a start point for the path and then an end point to define the extents of the array.

Pressing the space bar will flip the side of the line on which the components are being drawn. There is also an Offset setting on the Options bar which allows you to define a space between points being picked and where the components will actually be drawn.

Several options in the Type parameters allow you to control how the detail component will repeat. The default method has the Layout parameter set to “Fixed Distance” and by setting a spacing value, the detail component will be copied at that spacing, as many times as will fit between the two points defining the length of the path. For example if you set the spacing to 3 feet and then pick a path that is 10 feet long, it will create 4 copies at 0’, 3’, 6’, and 9’.



Other Layout options include Fill Available Space, Fixed Number, and Maximum Spacing. The maximum spacing option lets you specify a spacing value but it will reduce the actual spacing to allow the components to fill the available distance. In the previous example, if the maximum spacing was set to 3 feet and you filled a path that was 10 feet long, it would create 5 copies equally spaced at 2’-6”.

The Fill Available space option will create as many copies of the detail components as can possibly fit along the extents of the path without allowing any spaces between components or overlaps.

The fixed number Layout option will enable an instance parameter for the number of copies that will be created. This number will then be divided equally along the length of the path. This method ensures that there will be a detail component at the start and end points of the path and it will adjust the space between components as required. This layout method will also allow components to overlap.

Exercise Notes

In the following exercise you are going to learn how to create detail views and work with 2D detail components to develop construction details.

1. Open your Manor House project that you created in the level one and level two courses. Switch to the first floor plan view and zoom in around the upper right corner of the Great room.
2. We are going to create a Wall section view and two enlarged section details showing the conditions at the foundation footing and the top of the foundation. We already have a full building cross section that cuts through the window on the North side of the great room. One option for creating our initial wall section would be to activate the Cross Section View and then use a large callout to encompass the wall at the left end.
3. Double click the arrow on the cross section view to make that view active. From the view tab on the ribbon choose the Callout / Rectangle tool on the Create panel and then drag a rectangular region around the entire exterior wall on the left side. Pick the outline of the callout to enable its control grips and reposition the callout head to the upper left corner arc.
4. With the callout still selected, look in the Type pulldown of the properties palette to confirm that the callout is defined as a Building Section. Deselect and then double click the callout head to make the view active. Note the location of the current view in the Project Browser showing the name of the view as Cross Section – Callout 1 below the Building Sections category. In the View name section of the properties palette, rename the view to Wall Section W1.
5. Check the type pulldown and choose Detail View. Note how the location of the view in the project browser has changed, with the view now displayed below the Detail Views category.
6. Depending on the version of Revit you used to start your project, you may already have a Wall Section category available. If you make that type active in the type pulldown, it will move your Wall Section view to that category in the project browser.

7. If you do not have a Wall Section type in the Type pulldown, you can create one with the following steps:
 - a. Switch to the floor plan view and take a look at the Cross Section tag. The solid filled arrowhead indicates that this references a full building Section. A Wall Section should show an open arrowhead and the extents of the view will be much smaller.
 - b. From the Create panel on the View tab, choose the Section tool and then pick a point just outside the upper window in the east wall. Drag the section line through the window and a couple feet into the great room and pick second point.
 - c. Select the Section line and view its type in the properties palette – Building Section. Change it to Detail View and note how the head on the section line changes to a circle with no arrow. Change it back to Building Section.
 - d. From the Insert tab, choose Load Family and open the Annotations folder. Scroll down until you find “Section Head – Open” and then pick it and choose open.
 - e. Select the Section line again and choose Edit Type. Duplicate to create a new type called “Wall Section” and pick OK.
 - f. Change the Section Tag parameter and it will open another type properties dialog showing that this is controlled by a nested family called “Section Tag”. Pick Duplicate and create a new type called “Section Head - Open, Section Tail – Filled” and pick OK.
 - g. In the Section Head parameter, from the dropdown list, choose Section Head – Open. Pick OK to return to the Section family type properties and the new Section Tag type should be active. Pick Ok.
8. The Section head should now show an open arrow and in the Section type pulldown, the Wall Section should be displayed. With the section line still selected set the View Name to “Wall Section W-1”. Adjust the size and position of the Section line to ensure you are cutting through the window but still not touching the the dimension witness line to the window.
9. Pick outside the section line and then double-click the section head to switch to that view. By default the crop region extends to the upper most level for the top of roof. Adjust the crop region to reduce the overall height of the view.

10. To determine the best view scale to use for the Section, it is easiest to add it to a sheet. In the project browser, double click Sheet A11-Cross Section to make it active. Move the cross Section view to the upper right corner of the sheet.
11. Drag the Wall Section view on to the left side of the sheet and set the scale to $3/8" = 1'-0"$.
12. That is a pretty good fit, but I think I would like to have more room for the details on the same sheet as the Wall Section. Delete the wall section view from this sheet. Move the Cross Section view back to the center of the sheet and change its scale to $1/4" = 1'-0"$. Better. ☺
13. Create a new sheet and name it A13 – Wall Section and Details. Drag the Wall Section to the left side of the sheet. If your level heads and labels are showing on different sides of the view, toggle their visibility to arrange them all on one side. Add jogs and adjust as required.
14. With the wall section view active, choose the Callout tool from the create panel and drag out a rectangular callout region around the footing and bottom 2 feet of the foundation wall. Position the callout head at the upper left corner.
15. Use the Size Crop tool on the ribbon and set the dimensions to $4" \times 3"$. With the callout still selected, set the view type to Detail View and change the View Scale to $1 \frac{1}{2}" = 1'-0"$. Set the view name to Foundation Detail Section 1. Check the Size Crop again to see that it is now showing as $8" \times 6"$. The size changes as the scale changes.
16. Create a second callout region around the top of the foundation wall and the lower section of the first floor wall. An easy way to do this and keep the second callout aligned and sized to match the first is to copy the first callout up to the new location. Check the name for the copied callout to confirm that it is called Foundation Detail Section 2.
17. Double click the sheet area to make it active and then find the two new detail views in the project browser. Drag the Foundation Wall section 1 to the lower section of the sheet with the view title aligned with the Wall Section W-1 title. Drag the second detail to the upper portion of the sheet and you will see an alignment line appear which helps you to align the details so the portions of the foundation wall are aligned. Note how the views ' crop regions are also identical in size and aligned with each other for a nice, neat layout. This was made easier by using the crop size tool and by copying the first callout to create the second.
18. Turn off the level heads in the two details and drag the level lines into the detail border.

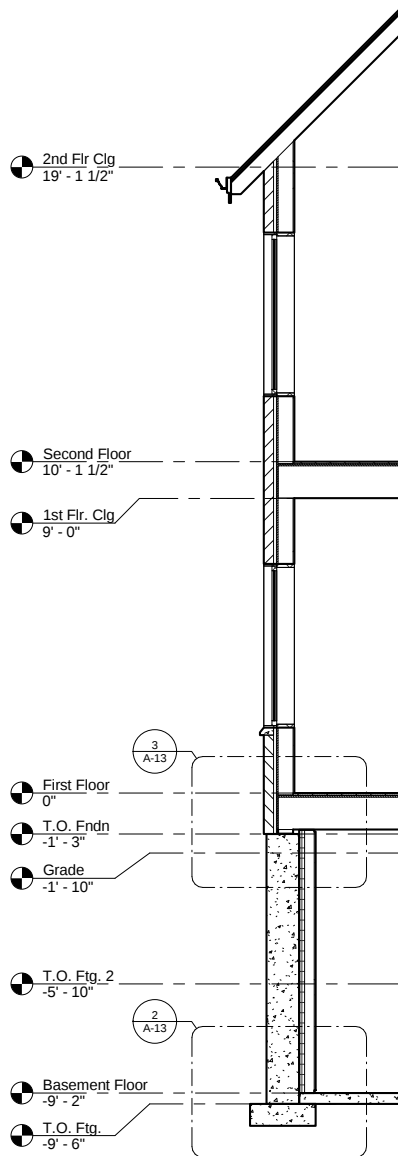
19. Zoom in to the footing detail and activate the view. Select the footing and choose Edit type. The footings were initially added with the default size of 36" x 12" and this is larger than is required for even a 12" wide foundation wall. Typical residential footings are only 18" wide by 6" deep. We can reduce the size of our footings to 24" x 8" deep. Rename the type and adjust the dimension parameters and all of the footings in the project will resize.
20. The next change we need to make is to add a partition wall along the inside face of the foundation wall so we can add insulation. It would be possible to show this with just detail components but it makes more sense to add the broad strokes in the actual 3D building model. Switch to the basement plan view and zoom in to where our wall section is cutting through the foundation wall. Add a 4 ½" interior partition wall along the section of foundation wall we are detailing. Eventually we will need to add this around the entire foundation but this will also require adjusting the basement stair position and the opening to the first floor so for now, just add a single segment so we can get back to the details. The wall should run from the basement level up to the T.O. Fndn. Level with a top offset of 1 1/4".
21. Switch back the Wall section sheet and you should see the new wall appear in all 3 views. Activate the footing section view and zoom in around the bottom of the interior wall. We are going to swap the layer of drywall next to the concrete for a 2" wide section of rigid insulation.
22. Pick the wall, choose Edit Type, and Duplicate. Call the new wall "Interior Fndn Partition". Choose Edit Structure and change the bottom layer of Drywall to Rigid Insulation with a thickness of 2" and then pick OK. If the insulation appears on the wrong side edit the structure again and use move up and down options to reverse the two finish layers.
23. Finally. Time to add our first Detail Component. 😊 From the Annotate tab on the ribbon choose Component and then pick Load Family. Open the Detail Items folder and then go to Div 06-Wood and Plastic and then 061100-Wood Framing. Choose Nominal Cut Lumber-Section and pick open. In the type library, browse down to 2x4 and then pick open. The 2x4 stud will appear at your cursor. Press the space bar to rotate the stud into a horizontal position and then pick a point at the bottom of the stud component in the wall.

24. The concrete slab is currently showing as touching the foundation wall but it should have a fiber expansion joint between the slab and the wall. Add a second detail component, go to Div 07- Thermal and Moisture Protection and then 079500-Expansion Control / Expansion Joint, and pick the Fiber Expansion Joint-Section component and pick Open. This time the component appears at the cursor right away. In the type pulldown choose the ½" thickness type and then pick a point at the lower left corner of the concrete slab.
25. Next, we will add a 4" weeping tile outside the footing and aligned with the bottom. Add a detail component from Detail Items / Div 33-Utilities / 334600-Subdrainage / Drainage pipes-Section. In the type pulldown, change the size to 4" and add the pipe component around the outside of the footing near the bottom.
26. We have now added 3, 2D components on top of the background view of our model. In the properties palette, set the Display Model setting to Halftone. Change it to Do Not Display and then set it back to Normal. At this point our 2D components are not constrained to the building model and that means that if the model changes, such as the wall moving or the floor level changing, the detail components will not shift to follow the model. It is possible to lock the 2D components to the model however so that they will be constrained.
27. Use the Align command to align the bottom of the drainage pipe with the bottom of the footing. Pick the lock icon. Repeat to align the side of the pipe to the side of the footing and lock this as well. Zoom in to the wood 2x4 component and drag it up away from the slab and then back down to touch the slab. A lock icon will appear and you can lock this as well. Drag it left and right and then lock it into position with the stud component of the wall. Repeat this procedure with the fiber expansion joint.
28. Next, we will add a bed of crushed stone below the slab. Add another detail component from Detail Items / Div 32-Exterior Improvements / 321100-Base Courses and pick the Base Course- Gravel-Section component. This time, when you pick Open, no component appears at your cursor but you will see a prompt to "enter component start point". This is a line based detail component that will be drawn between two points in the view.

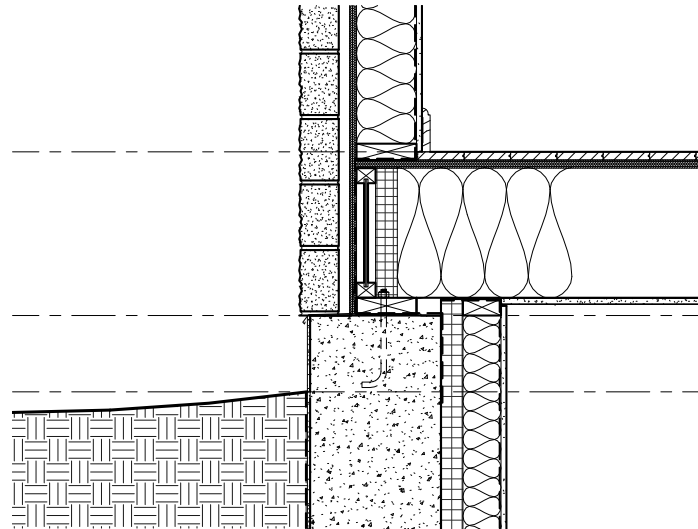
29. Choose a start point at the upper right corner of the footing and start dragging your cursor to the right. Press your space bar to flip the component to either side of the line so the course appears below the slab. Pick an endpoint for the course at the extents of the view and two lock icons will appear. Lock both. Pick the base course and try toggling its type to 6" course and then back to 4" course to finish.
30. Zoom in to the bottom of the wood plate component and move it up 1/8". Choose to remove constraints when prompted to unlock the wood from the floor slab. At this scale we can show the foam gasket that must go between the wood wall and the concrete slab. Choose component and then look in then type pulldown to find the fiber expansion joint 1/4" thick type. Foam wall plate gaskets are actually only about 1/8" thick so duplicate the 1/4" fiber joint type and create a new component type that is 1/8". Change the keynote designation to 07 26 00 and add the new component below the wood plate. Adjust the width so it sticks out about 1/4 inch on either side of the wood.
31. While we are zoomed in, we should also show that the drywall must not touch the slab. Adjust the structure of the wall type and Modify the Vertical Structure. Zoom into the bottom of the wall sample view in a section style view and pick the bottom of the drywall. Unlock this component so it can be modified with a base extension parameter. Pick Ok to apply changes.
32. With the wall still selected adjust the base extension property to 1" and the drywall should lift up from the concrete slab. The footing area is off to a good start and we can finish it off with lines, regions, and cut profile tools in the next class.
33. Switch to the other detail view at the top of the foundation wall. Start by adding a 2x4 to the top of the interior finish wall, a 2x6 to the bottom of the first floor wall, and another 2x6 at the sill plate outline on top of the foundation wall. Align the top of the 2x6 sill plate with the underside of the floor system and then add a 1/8" fiber component.
34. Pick the sill plate gasket and choose edit family. Save the family with a new name and browse up to Div 07-Thermal and Moisture Protection / 071300-Sheet Waterproofing and call it Foam Sill Gasket-Section. After saving the family. Choose to Load it into the project. Now select the components below the wood plates and change their type to the new Foam Sill Gasket section.

35. Add a new detail component from the Wood division / 061700-Shop-Fabricated Structural Wood. Choose the Wood I Joist-Section family and pick Open. Select the Type with a Depth of 11 7/8" and pick OK. Insert the component in the end of floor joist area along the bottom edge of the floor sheathing layer. Align the component to the left edge of the wood sill plate. Copy the component 2 feet to the right. Hmmm. Let's not make that call yet on the direction of the joists. They will likely actually be running the other way. Delete the copied joist.
36. Add a new detail component from the Wood division / 061600-Sheathing and pick the Plywood-Section family. After picking open, you will be prompted to pick a start point, indicating that this is another line-based detail component. The 3/4" type is the correct thickness for the floor sheathing so pick a start point at the upper left corner of the I-Joist and then drag across to the right and pick a point outside the view.
37. Add a second section of plywood sheathing, with a thickness of 5/8" to trace the vertical wall sheathing. Start at the lower left corner of the sill plate and then drag up until it fills the view. The orientation of the hatching looks weird. I wish I could say there was an easy fix for this but unfortunately at this time drafting hatches for detail elements will not automatically rotate to match the alignment of the element. Try drawing a few more sections of plywood at horizontal, vertical and various in-between angles. In all instances, the hatching is horizontal. Sigh.
38. Delete the plywood detail components. From the Manage tab on the ribbon, choose Materials and then find the Plywood, Sheathing material. On the graphics tab on the right, pick in the empty swatch for Pattern under Cut Pattern. Scroll down and find the Plywood-Align pattern and pick Ok to assign this pattern to all objects using the Plywood, Sheathing material. Pick Ok and you should now see a plywood hatch pattern, correctly oriented along both vertical and horizontal sections of plywood.
39. Add a new detail component from Div 09-Finishes / 096000-Flooring / 096400-Wood Flooring and open the Wood Strip Flooring-Section.rfa family to load it into the project. Add a single instance of the component above the floor.
40. Pick wood floor component and edit its type. Duplicate it and create a new type called 1"x5" and set the width parameter to 4 1/4". Pick ok.

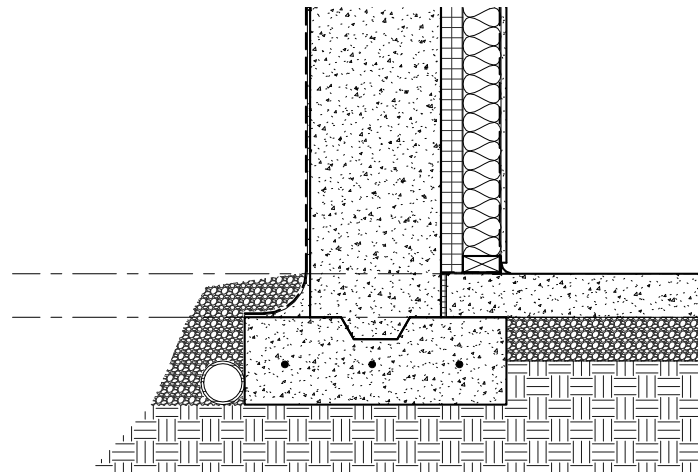
41. From the component flyout, choose Repeating Detail component. In the type pulldown, there is only one option for the repeating detail brick. Choose Edit Type. Duplicate the type and create a new type called Wood Floor-Section. In the Detail parameter field scroll to the bottom and pick the Wood Strip Flooring-Section: 1x5 family. Set the spacing to 4 ¼" to match the width of the floor boards and pick OK. Try dragging out a section of flooring and you can see that it is not oriented correctly. The repeating detail tool was created with vertical coursing such as bricks in mind for its default application.
42. Pick the Repeating Detail component tool again and pick Edit Type. Set the detail rotation parameter to 90 degrees clockwise and pick OK. Choose a start point at the upper left corner of the wood floor section and then drag your mouse to the right until it extends outside the view.
43. Add a new detail component from Div 07-Thermal and Moisture Protection / 0721000-Thermal Insulation / 072200-Roof and Deck Insulation / and Open the Rigid Insulation-Section family. Set the width to 2" in the type pulldown and then add a vertical section aligned to the inside of the I-joist.
44. Add a new detail component from the Div 05-Metals / 050500-Common Work Results / 050523-Metal Fastenings directory. Pick Anchor Bolts Hook-Side and pick Open. From the type pulldown, choose the ½ thick type and add it so the nut on top is aligned with the middle of the top face of the sill plate.
45. The majority of the anchor bolt should be displayed with a hidden linetype. We will fix this and continue to refine both details in the next lesson. Save and close your file.



① Wall Section W1
3/8" = 1'-0"



③ Foundation Wall Section 2
1 1/2" = 1'-0"



② Foundation Wall Section 1
1 1/2" = 1'-0"

Green Inc.
Manor House
Wall Section and
Details

Project number	2014_3-3
Date	Oct. 31, 2014
Drawn by	KB
Checked by	KB

A-13

Scale	As indicated
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